Multi-species systems in Agroecology

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NATIONAL SCHOOL OF FORESTRY

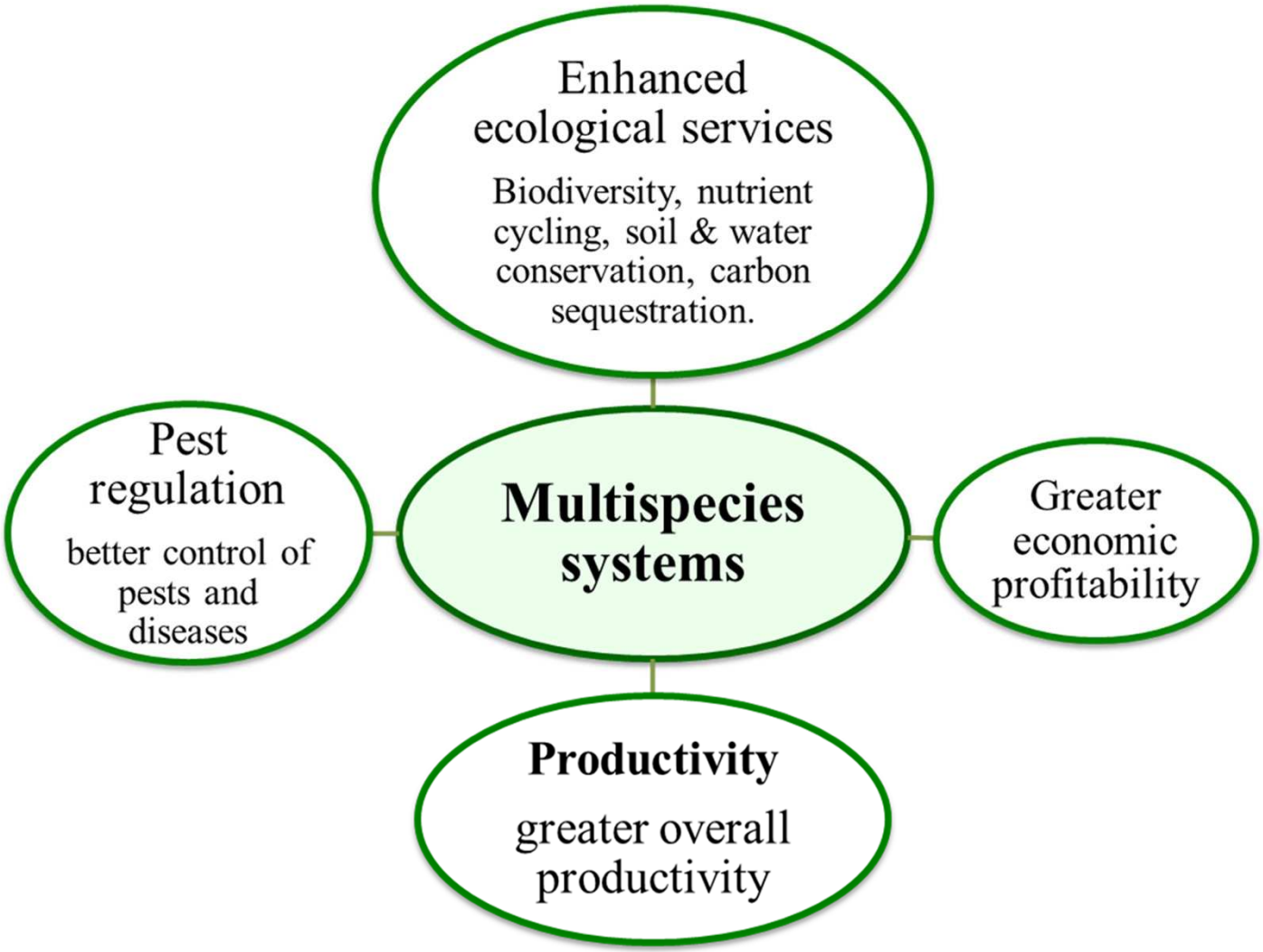
UNIVERSITY of Cumbria

BES 1st Agroecology meeting

1st 2nd November 2012, London

Sustainable agriculture...

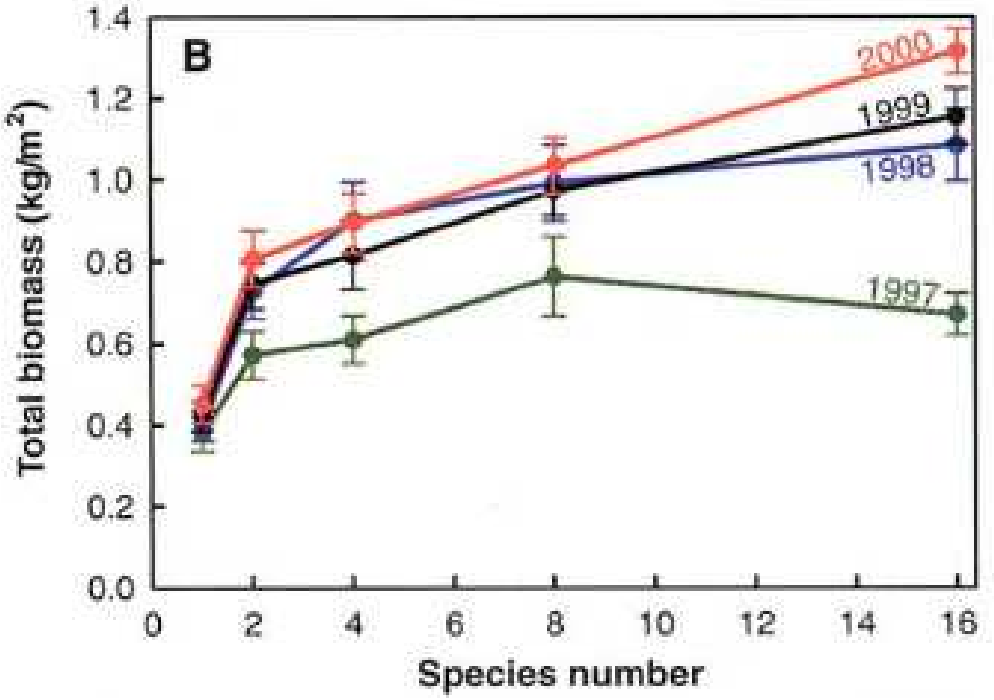
Benefits of multispecies systems



Adapted from Malézieux *et al.*, 2009. *Agron. Sustain. Dev.* **29** 43–629

Diversity and production

“16-species plots attain 2.7 times greater biomass than monocultures”



Tilman *et al*., 2001. *Science* **294** (5543) 843-845

Use of multispecies systems

- Subsistence production (tropics)
- Agroforestry (tropics, then temperate)
- Cottage gardens (European)

Little commercial production

Few published studies on barriers to use

Given the apparent advantages, why aren't they more used?

Use of multispecies systems

Given the apparent advantages, why aren't they more used?

Mechanisation? Labour costs

Complication? Knowledge and experience

Unfamiliarity? Trying new things - risk

Unpredictable yields? **Opportunity cost**?

Scale?

Scale in multispecies systems

Market gardens?

e.g. Bosley Patch,
Henley-on-Thames

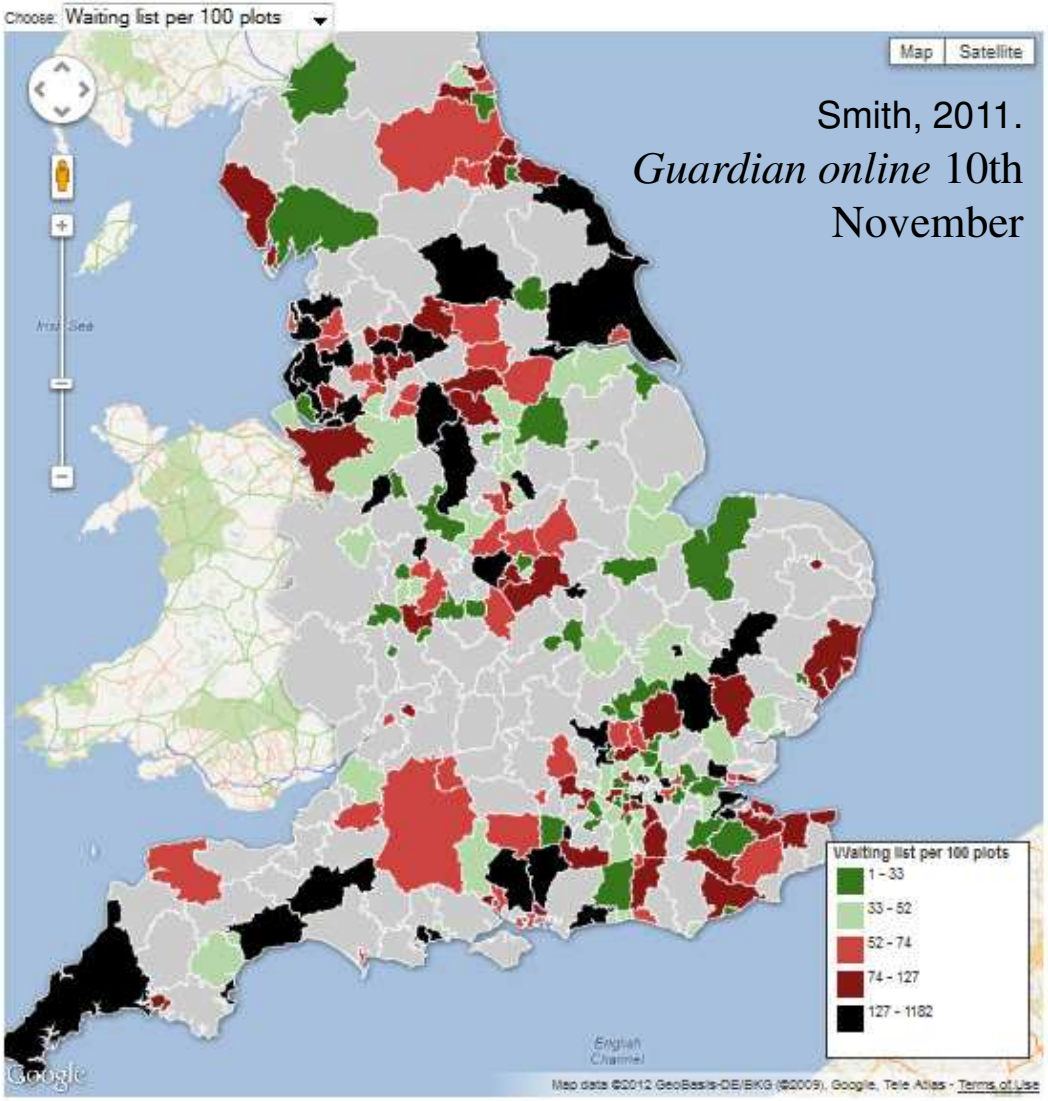
Allotments?

Household food production

Similar issues of land availability as in global agriculture

"Allotment demand leads to 40-year waiting lists"

Jones, 2009.
Guardian online 2nd June



Polyculture Productivity:

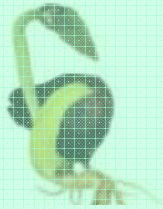
Diversity and Efficiency in "grow your own" food production

Naomi van der Velden[1], Andy Goldring[2], Tomas Remiarz[2],
Roz Brown[2], Ian Fitzpatrick[2]

[1] NATIONAL SCHOOL OF FORESTRY
[1] UNIVERSITY of Cumbria
[2] Permaculture ASSOCIATION

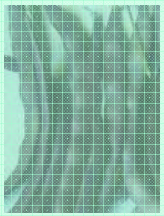
March - October 2011

Aim

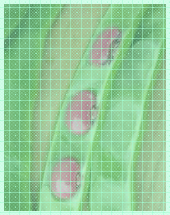


Methods

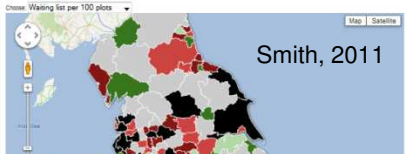
Results



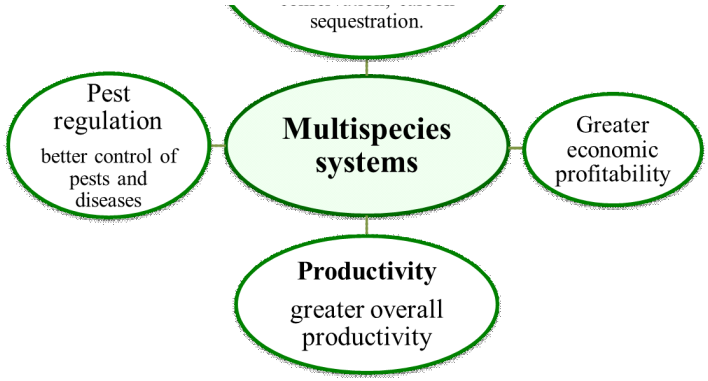
Context

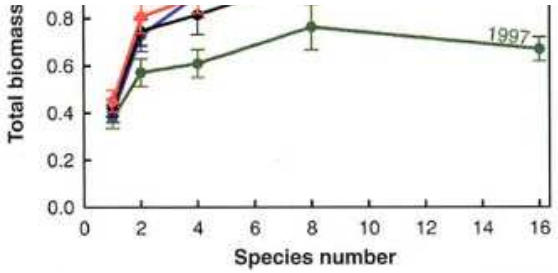


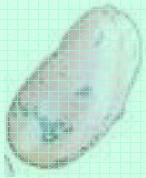
Diversity and production



Aim: To compare productivity of Low- and High-diversity mixes of veg in household gardens



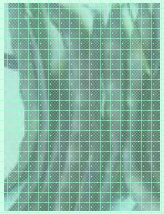




Rationale

Methods

Results



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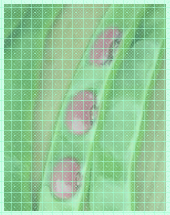


Public participatory trial

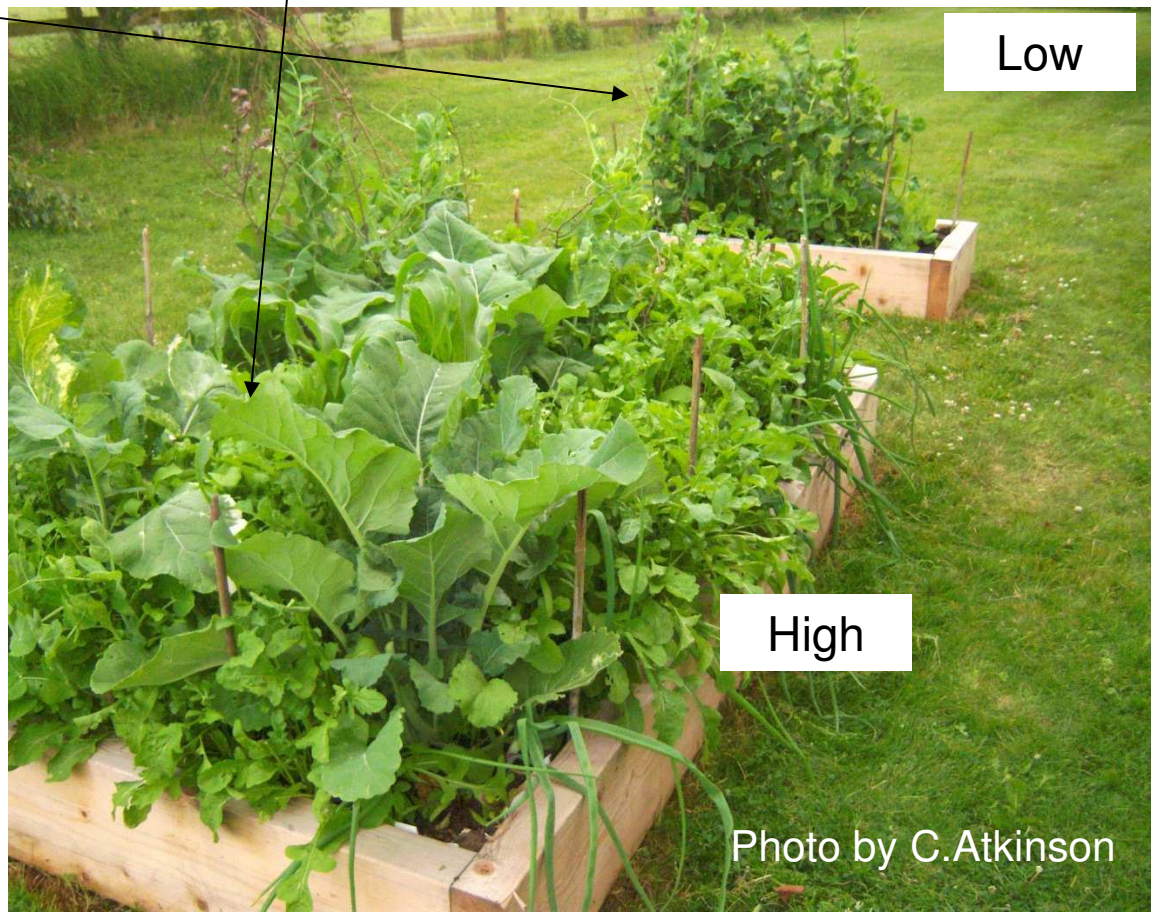
7 plant families
12 crops (plus 1 flower).

50 sets of seeds to participants

Weigh each crop every harvest.

Record time spent on each plot.

Questionnaires



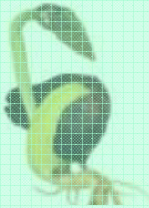
Mixed vegetable research trials (2011)

Information for participants

Permaculture Association

Working in partnership with the National School of Forestry and Centre for Wildlife Conservation at the University of Cumbria

Rationale



Methods

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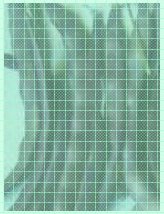

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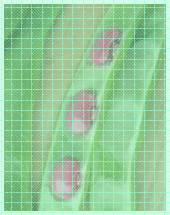
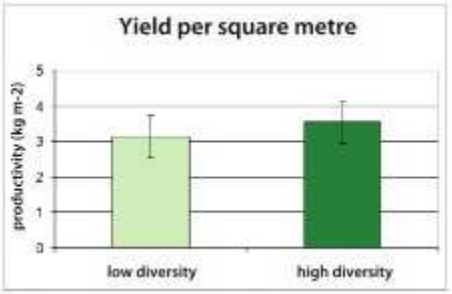
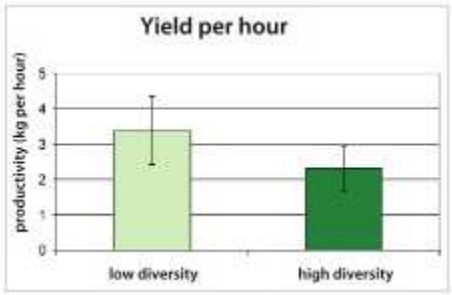
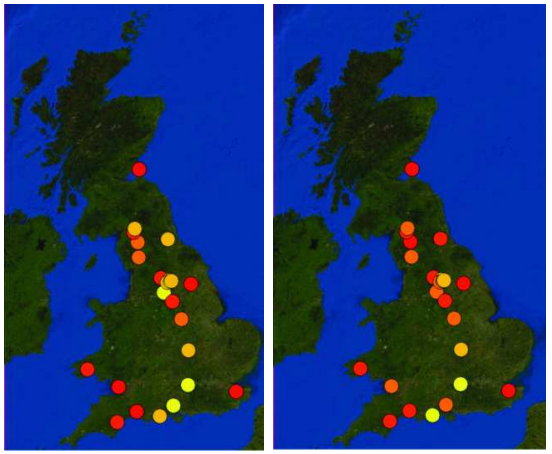
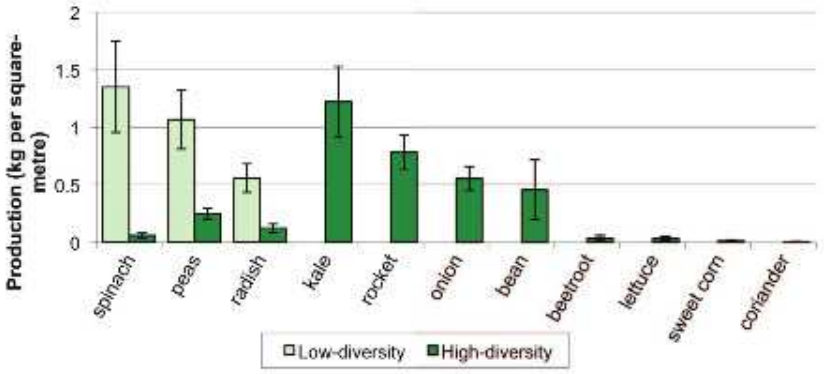


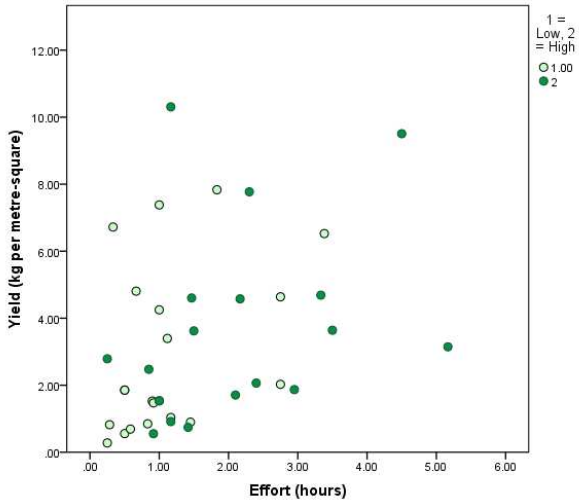
Veg production



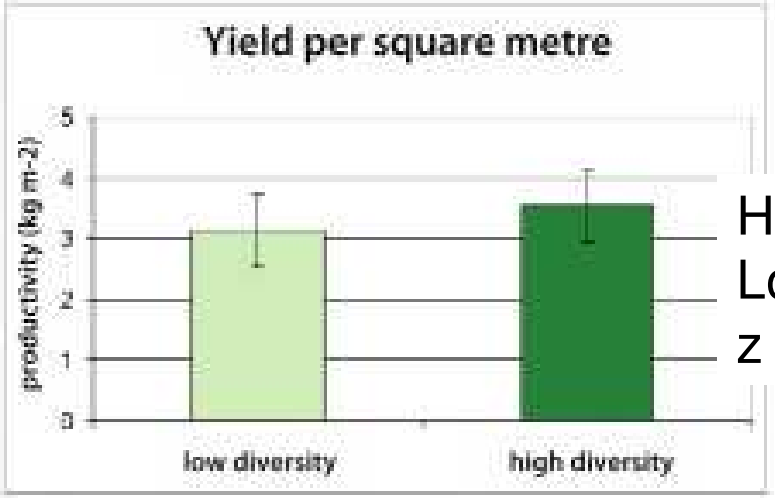




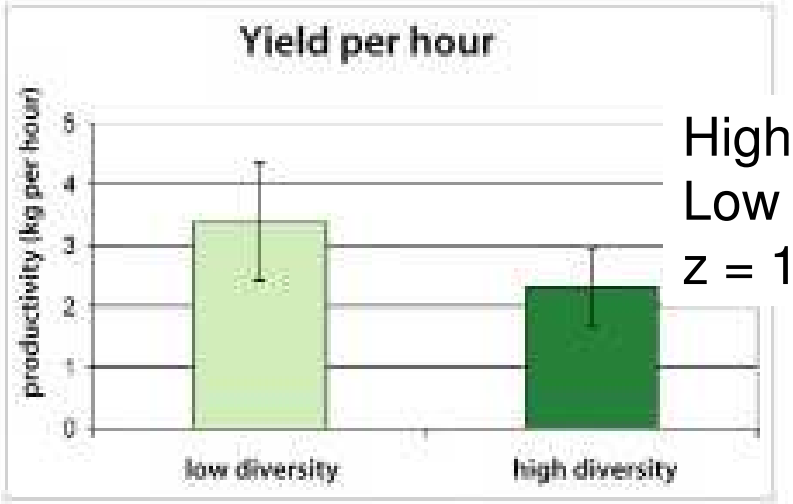




Veg production

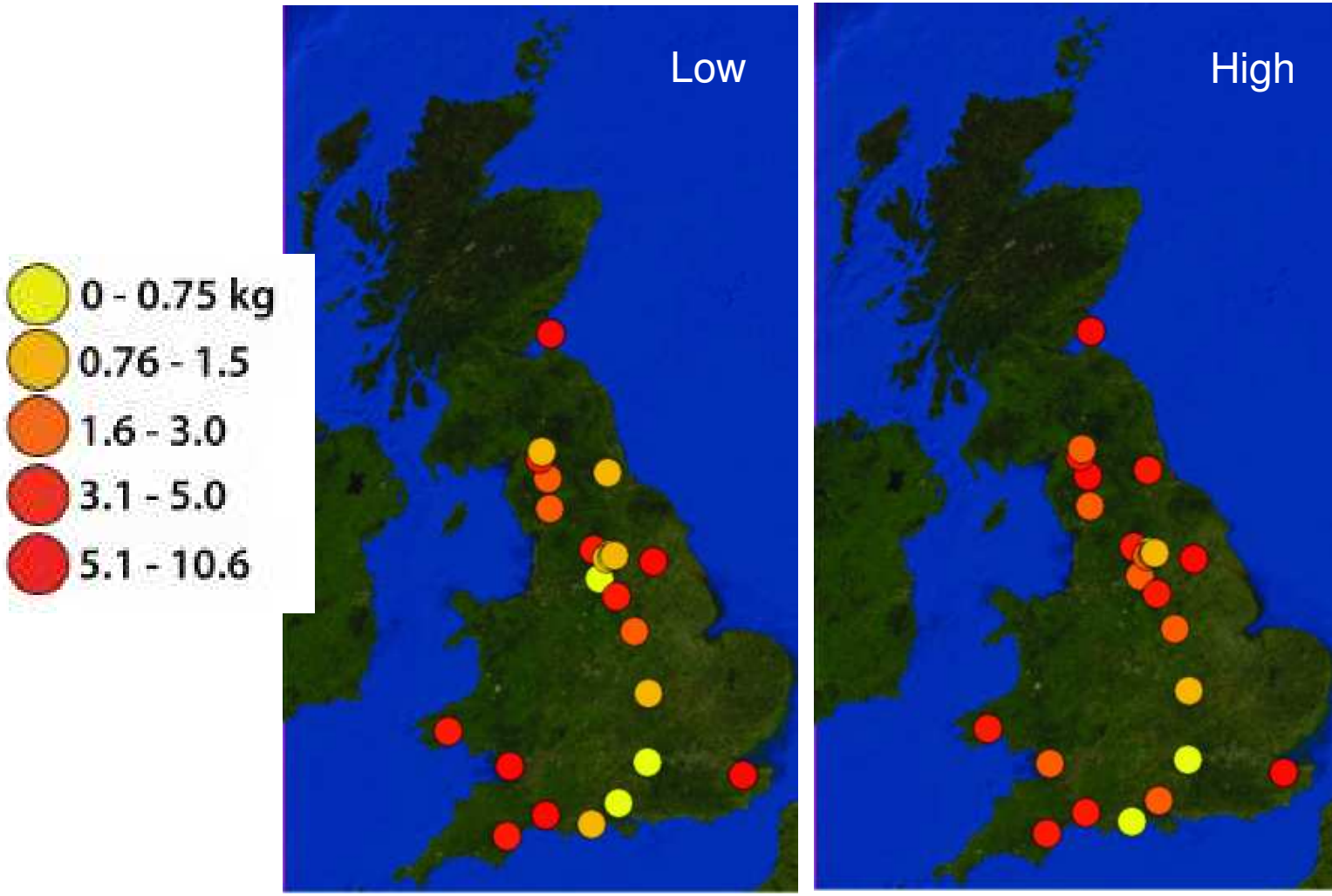


High 3.5 ± 0.6 kg m^{-2}
Low 3.1 ± 0.6 kg m^{-2}
z = 1.154, p = 0.130.

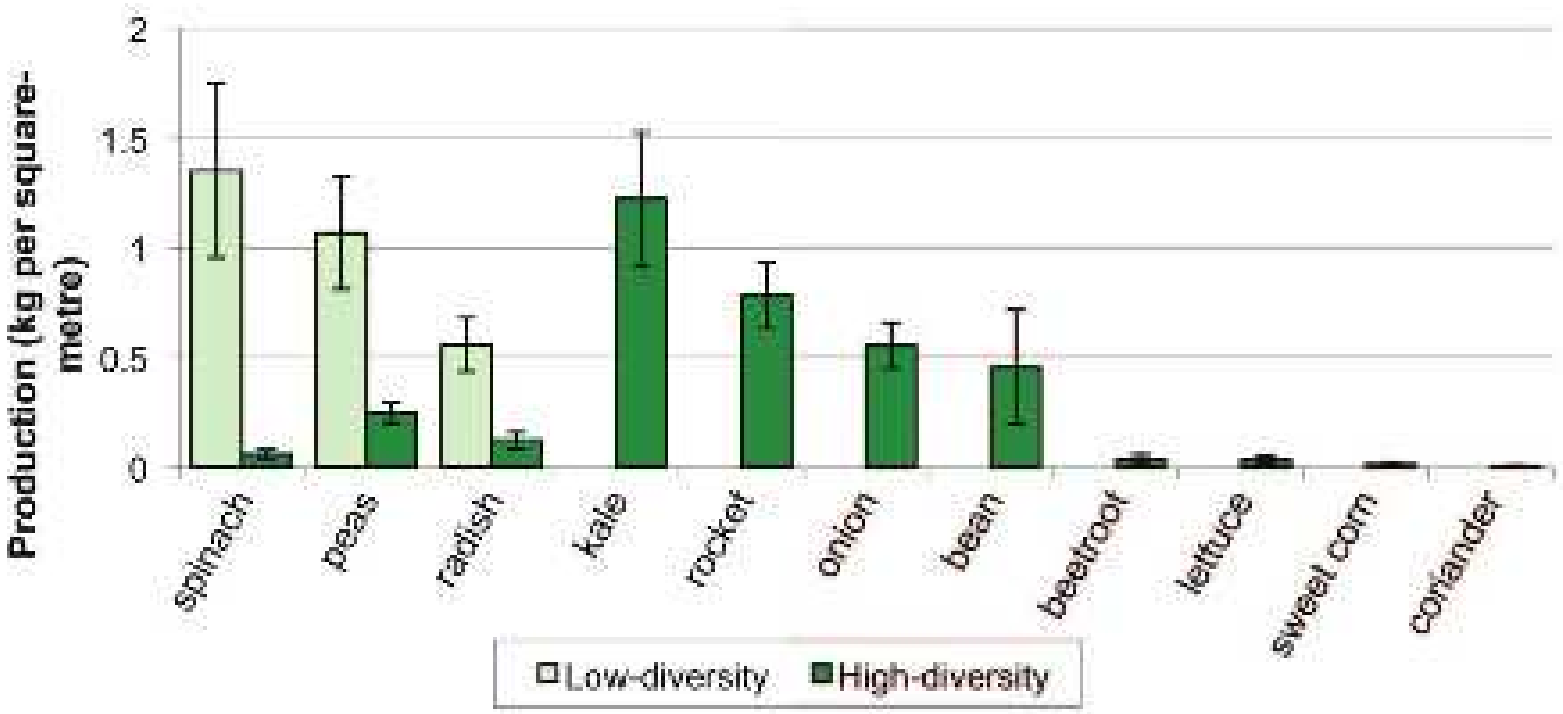


High 2.3 ± 0.6 kg m^{-2} hr^{-1}
Low 3.4 ±1.0 kg m^{-2} hr^{-1};
z = 1.680, p = 0.093

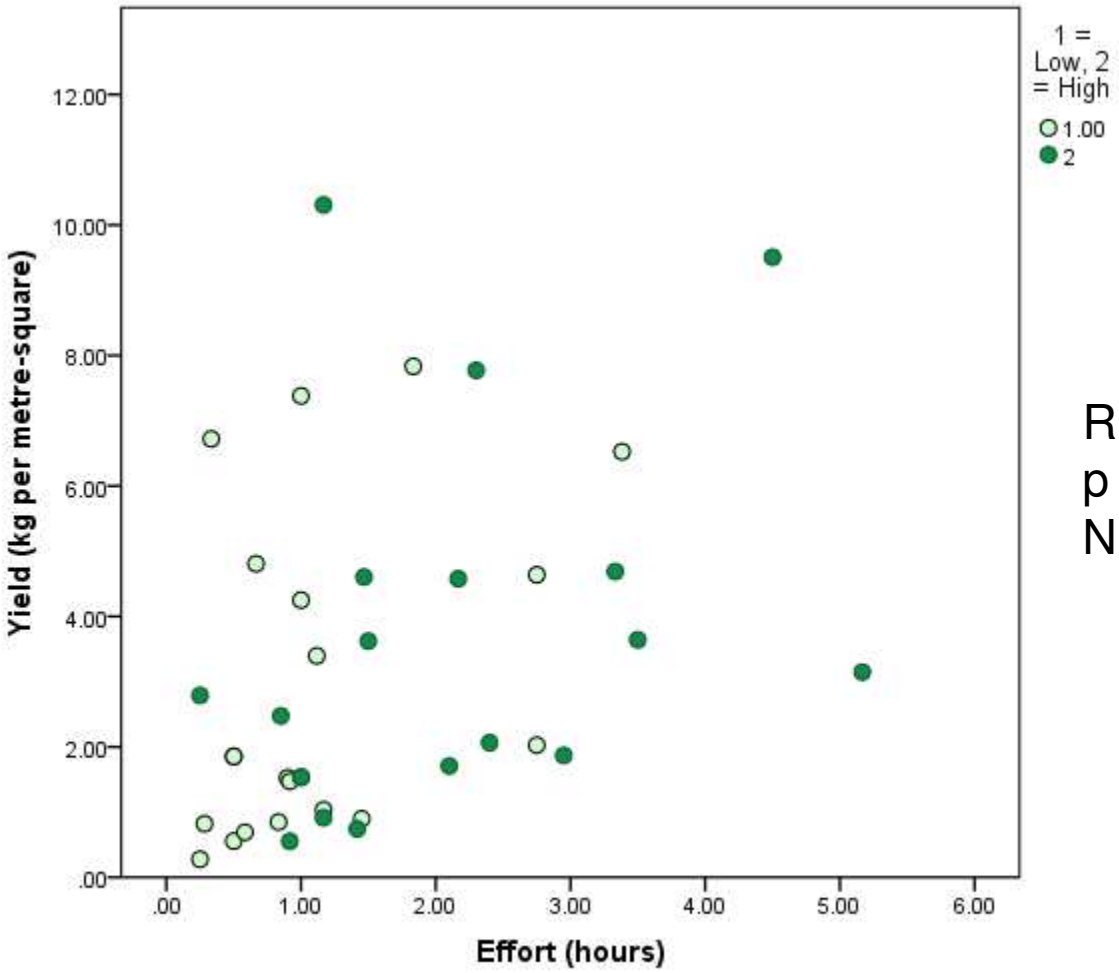
Veg production



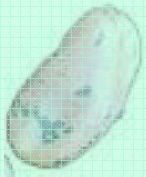
Veg production



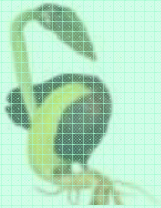
Veg production



R = 0.462
p = 0.03
N = 39



Rationale



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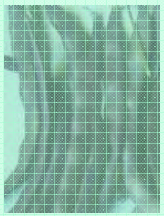
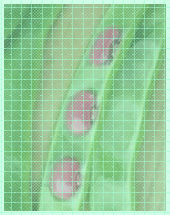
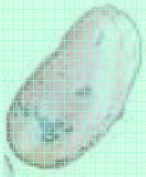


Context



Veg production

- Average production was equivalent to 35 tonnes per hectare.
- No significant difference in total yields
- Significant differences in individual species (More peas, spinach & radish from Low-diversity plot)
- Production linked to effort (50%), plus probable differences in soil, weather, location etc.



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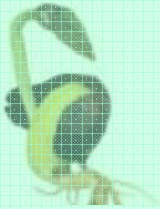

Methods

Results

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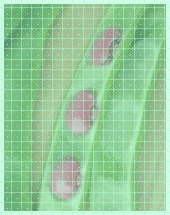


Context and next steps

Household yields are high; 35 tonnes ha^{-1}.

- Allotment yields of 16 tonnes ha^{-1}, Supplying 10% of UK food production. (Stamp, 1948)
- UK field veg yields 19 tonnes ha^{-1} in 2011 (BHS, 2012)

Polycultures may yield more than monocultures at this scale.

Production linked to effort (50%). **Time costs are leisure time. Additional health benefits to gardening** (Leake *et al.*, 2009)

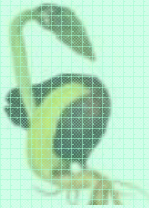
Own-produced food could meet some [UK] food demand in a low input, low-impact way. How much?

BHS – British Horticultural Society info [online records]

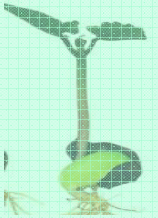
Leake *et al.*, 2009 . *Environmental Health* 2009, **8**(Suppl 1):S6

Stamp, 1948 *The Land of Britain: it's use and misuse*. Longmans, Green & Co.

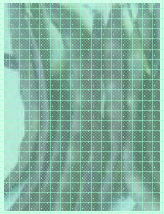
Rationale



Methods



Results



Context

References

Jones, R. 2009 "Allotment demand leads to 40-year waiting lists" *Guardian online* 2nd June [accessed 14/8/12] http://www.guardian.co.uk/money/2009/jun/02/allotments-shortage-waiting-lists

Malézieux *et al*., 2009 Mixing plant species in cropping systems: concepts, tools and models. A review *Agron. Sustain. Dev*. **29** 43–62

Smith, A.P. 2011 "The English allotment lottery mapped" *Guardian online* 10th November [accessed 14/8/12]. http://www.guardian.co.uk/news/datablog/interactive/2011/nov/10/allotments-rents-waiting-list-england

Stamp, 1948 *The Land of Britain: it's use and misuse*. Longmans, Green and Co. London

Tilman *et al*., 2001 Diversity and Productivity in a Long-Term Grassland Experiment. *Science* **294** (5543) 843-845.

Rationale

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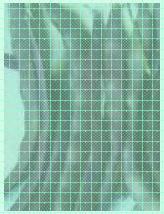

Context

Thanks!

Thanks - For listening!

To all the participants, to co-ordinators Celia Ashman and Edgars at the Permaculture Association. To Chris Evans for advice on appropriate plant mixes. Thanks to these seed companies for supplying the seeds

BEANS and Herbs

Chase Organics

TUCKERS SEEDS

garden organic

Contact : n.k.vandervelden@cumbria.ac.uk